Claims

1.   A method of adjusting the kerning distance between adjacent characters in a character string without use of a previously stored distance for each character pair, said adjacent characters comprising a first, positioned character, and a second character to be

5   positioned adjacent said first character and spaced therefrom by the kerning distance, said method comprising the steps of:

making said second character approach said first character,

calculating a two dimensional measure of the approach of said second character to said first character, and

10   stopping said approach when said two dimensional measure passes a threshold value.

2.   The method as claimed in claim 1 wherein said two-dimensional measure comprises a plurality of one-dimensional measures taken in a first direction and each spaced apart in a second direction, and said method comprising the further steps of:

15   calculating the mean of said one-dimensional measures,

calculating the variance of said one-dimensional measures from said mean, and

adjusting said threshold value in accordance with said variance.

3.   The method as claimed in claim 2 wherein said threshold value is adjusted

20   in proportion to said variance.

4.   The method as claimed in claim 1 wherein said two-dimensional measure comprises a plurality of contours each regularly spaced from the boundary of said characters by a corresponding multiple of a predetermined contour spacing, and said method comprising the further steps of:

25   stopping said approach when a predetermined one of the contours of both characters intersect.

5.   The method as claimed in claim 4 wherein the method of calculating said contours are selected from the group of distance measuring methods consisting of Euclidean distance and city block distance measuring.

6. The method as claimed in claim 1 wherein a limit is placed on said approach.

7. The method as claimed in claim 6 wherein said limit is no overlap of the vertical sides of upright bounding boxes.

8. The method as claimed in claim 6 wherein said limit is no overlap of bounding boxes comprising convex hulls of said characters.

9. A system for adjusting the kerning distance between adjacent characters in a character string without use of a previously stored distance for each character pair, said adjacent characters comprising a first, positioned character, and a second character to be positioned adjacent said first character and spaced therefrom by the kerning distance, said system comprising the approach means to make said second character approach said first character, calculating means to calculate a two dimensional measure of the approach of said second character to said first character, and threshold means to said approach means and said calculating means to stop said approach when said two dimensional measure passes a threshold value.

10. The system as claimed in claim 1 wherein said two-dimensional measure comprises a plurality of one-dimensional measures taken in a first direction and each spaced apart in a second direction and said calculating means calculates the mean of said one-dimensional measures, and calculates the variance of said one-dimensional measures from said mean, and said threshold means adjusts said threshold value in accordance with said variance.

11. The system as claimed in claim 10 wherein said threshold means adjusts said threshold value in proportion to said variance.

12. The system as claimed in claim 9 wherein said calculating means calculates said two-dimensional measure as a plurality of contours each regularly spaced from the boundary of said characters by a corresponding multiple of a predetermined contour spacing, and said threshold means stops said approach when a predetermined one of the contours of both characters intersect.

13. The system as claimed in claim 12 wherein said calculating means calculates said contours using a distance measuring method selected from the group of distance measuring methods consisting of Euclidean distance and city block distance measuring.

14. The system as claimed in claim 9 wherein a said threshold means places limit on said approach.

15. The system as claimed in claim 14 wherein said limit is no overlap of the vertical sides of upright bounding boxes.

16. The system as claimed in claim 14 wherein said limit is no overlap of bounding boxes comprising convex hulls of said characters.

17. A computer program product for adjusting the kerning distance between adjacent characters in a character string without use of a previously stored distance for each character pair, said adjacent characters comprising a first, positioned character, and a second character to be positioned adjacent said first character and spaced therefrom by the kerning distance, said product comprising the approach means to make said second character approach said first character, calculating means to calculate a two dimensional measure of the approach of said second character to said first character, and threshold means to said approach means and said calculating means to stop said approach when said two dimensional measure passes a threshold value.

18. The product as claimed in claim 1 wherein said two-dimensional measure comprises a plurality of one-dimensional measures taken in a first direction and each spaced apart in a second direction, and said calculating means calculates the mean of said one-dimensional measures, and calculates the variance of said one-dimensional measures from said mean, and said threshold means adjusts said threshold value in accordance with said variance.

19. The product as claimed in claim 10 wherein said threshold means adjusts said threshold value in proportion to said variance.

20. The product as claimed in claim 9 wherein said calculating means calculates said two-dimensional measure as a plurality of contours each regularly spaced

from the boundary of said characters by a corresponding multiple of a predetermined contour spacing, and said threshold means stops said approach when a predetermined one of the contours of both characters intersect.

21.   The product as claimed in claim 12 wherein said calculating means calculates said contours using a distance measuring method selected from the group of distance measuring methods consisting of Euclidean distance and city block distance measuring.

22.   The product as claimed in claim 9 wherein said threshold means places limit on said approach.

23.   The system as claimed in claim 14 wherein said limit is no overlap of the vertical sides of upright bounding boxes.

24.   The system as claimed in claim 14 wherein said limit is no overlap of bounding boxes comprising convex hulls of said characters.

25.   A method of adjusting kerning for modified characters where a kerning value for each unmodified character pair is known, said method comprising the steps of:

   a.   estimating an amplitude of the character modification in the kerning direction for each character of the pair,

   b.   applying a function to each amplitude, and

   c.   increasing the kerning value for each character pair by substantially the sum of said functions.

26.   A method as claimed in claim 25 wherein the modification to each character comprises perturbing the outline of the character.

27.   A method as claimed in claim 26 wherein the perturbation is selected from the group consisting of sinusoidal, square wave, and triangular wave perturbations.

28.   Apparatus for adjusting the kerning values for modified character pairs based on a known kerning value for each unmodified character pair, said apparatus comprising first memory means to store said known kerning value for each unmodified character pair, value adjusting means to add to each said known kerning value substantially the sum of functions which are applied to the estimated amplitudes of the

character modification for each character of the pair in the kerning direction, and second memory means to store the sum of said addition as an increased kerning value for each modified character pair.

29.   Apparatus as claimed in claim 28 wherein said first memory means is a ROM.

30.   Apparatus as claimed in claim 28 wherein said second memory means is a RAM.

31.   Apparatus as claimed in claim 28 wherein said value adjusting means is an adder.

32.   A computer program product for adjusting the kerning values for modified character pairs based on a known kerning value for each unmodified character pair, said product comprising first memory means to store said known kerning value for each unmodified character pair, value adjusting means to add to each said known kerning value substantially the sum of functions which are applied to the estimated amplitudes of the character modification for each character of the pair in the kerning direction, and second memory means to store the sum of said addition as an increased kerning value for each modified character pair.

33.   The product as claimed in claim 32 wherein said value adjusting means operates in accordance with the equation:

$$k = k_1 + f(a) + f(b)$$

where k is the adjusted kerning distance, k_1 is the known kerning distance, a is the amplitude of the perturbation applied to the a first of the characters of said pair of characters, b is the amplitude of the perturbation applied to the second of the characters of said pair of characters, and f represents the perturbing function.

34.   The product as claimed in claim 33 where the perturbing function has a maximum amplitude of f(max) = a and said value adjusting means operates in accordance with the equation:

$$k = k_1 + 2a$$

36. A method of modifying a kerning distance between a pair of modified characters having a shape different from the same pair of characters but unmodified, said method comprising the step of deriving from the changes in shape of the modified characters in the kerning direction a modified kerning distance.

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